

## **Military and Veteran Mental Health Literature Scan: 2013**

September 2014



This document presents an annual literature scan for the year 2013 in the field of military and veteran posttraumatic mental health. It was produced for the Australian Government, Department of Veterans' Affairs (DVA), by the Australian Centre for Posttraumatic Mental Health (ACPMH).

### **Disclaimer**

The material in this report, including selection of articles, summaries, and interpretations is the responsibility of the consultants, ACPMH, and does not necessarily reflect the views of the Australian Government.

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## List of acronyms

Term	Definition
ADF	Australian Defence Force
CBT	Cognitive Behavioural Therapy
Complex PTSD	Complex posttraumatic stress disorder
DSM-IV	The Diagnostic and Statistical Manual of Mental Disorders (DSM) 4th edition, produced by the American Psychiatric Association (APA)
DSM-5	The Diagnostic and Statistical Manual of Mental Disorders (DSM) 5th edition, produced by the American Psychiatric Association (APA) – released May 2013
MSBR	Mindfulness-Based Stress Reduction
NG	National Guard: the military reserve units controlled by each state of the United States
NHMRC	National Health and Medical Research Council
ODS	Operation Desert Shield/Storm
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
PTSD	Posttraumatic stress disorder
TBI	Traumatic brain injury
UK	United Kingdom
US	United States
VA	Veterans Affairs - The US Department of Veterans Affairs
VHA	Veterans Health Administration



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## Executive summary

This annual summary of the military and veteran mental health and traumatic stress literature for the year 2013 was produced by the Australian Centre for Posttraumatic Mental Health (ACPMH) for the Australian Government, Department of Veterans' Affairs (DVA). This executive summary provides an overview of the literature scan for each topic of review chosen in consultation with DVA.

### DSM-5 changes to PTSD diagnostic criteria (pages 11-13)

- Literature published in 2013 investigated the effects of the changes made to posttraumatic stress disorder (PTSD) and related trauma disorders in the recently released diagnostic and statistical manual 5<sup>th</sup> edition (DSM-5). Results generally suggest that prevalence rates for PTSD using the DSM-5 algorithm are similar to DSM-IV. However, the changes in DSM-5 have resulted in an increased number of possible combinations for diagnosis, which may have legal implications.
- Statistical modelling research in 2013 continues to add to the ongoing debate as to the true underlying structure of PTSD symptoms and whether they best map on to a three, four or five factor model.

### ICD-11 changes to PTSD criteria (pages 14-15)

- The proposed changes for the international classification of diseases 11<sup>th</sup> revision (ICD-11), due for completion in 2017, include re-classifying PTSD and related disorders into a category 'specifically associated with stress' and reducing PTSD diagnostic criteria to three core clusters including re-experiencing, avoidance of reminders, and excessive sense of current threat. The addition of complex PTSD and prolonged grief disorder have been proposed, as has the removal of acute stress reaction as a disorder.
- Two studies in 2013 showed support for the inclusion of complex PTSD as a disorder in its own right, and they highlighted that the proposed diagnostic system does not capture all of those with complex PTSD. The changes proposed to ICD-11 diverge significantly from the DSM-5 PTSD criteria and going forward it will be important to identify differences between the two systems.



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## Veterans and suicide (pages 16-20)

- Several US prevalence studies in 2013 indicate that suicide is a significant problem for veterans and a large number of studies investigated various characteristics associated with veteran suicides. In addition, studies investigated the US Veterans Health Administration policies and their effectiveness in reducing suicide rates in veterans.
- A vast number of studies investigated a wide range of potential risk factors associated with veteran suicides. Research in 2013 found evidence indicating pre-military or individual risk factors, such as childhood trauma, are linked to veteran suicide, but little evidence supporting a link between military factors, such as deployment related characteristics or combat exposure and suicide.

## Veteran family functioning and family descendant psychosocial outcomes (pages 21-25)

- Military families have unique strengths and challenges that can impact family functioning. Literature in 2013 showed that a military family connection (family or sibling) can negatively affect an adolescent's psychosocial wellbeing, but the specific role the military aspect plays in this relationship is unclear, as non-military related factors such as socio-economic status were not controlled for.
- Research also showed that changes to family structure and functioning during deployment, and veteran parental mental health post-deployment, impact family functioning.

## Anger in veterans (pages 26-28)

- Not many studies in 2013 investigated anger in veterans. Research showed that for veterans with PTSD, anger is the most commonly reported problem, and that exposure to a blast-force traumatic brain injury may be linked to changes in anger.
- A small number of treatment studies investigated whether established psychotherapies in 2013, such as CBT, can be used to reduce anger in veterans, but large-scale, rigorous studies are needed.



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## Veterans with sleep disturbance and (a) PTSD, (b) suicide, (c) old age (pages 29-32)

- Sleep disturbance, including insomnia, nightmares and daytime sleepiness, is a key factor of PTSD. Research in 2013 explored sleep disturbance in veterans with (a) PTSD; (b) suicide; and (c) old age:
  - a) Pre-deployment sleep problems predicted post-deployment psychiatric problems, such as PTSD, and post-deployment sleep problems are related to severity of PTSD
  - b) The relationship between insomnia and suicide is complex, and may be indirect through other psychiatric and social factors
  - c) There is some evidence that sleep problems are associated with older age, and older veterans have higher prevalence rates of sleep problems.

## PTSD and cardiovascular disease (pages 33-37)

- PTSD can increase the risk of cardiovascular disease through biological, behavioural and psychosocial risk factors. A meta-analysis showed PTSD or depression increased the risk of cardiovascular disease by up to 55%. Several studies in 2013 expanded on this relationship by measuring cardiovascular disease risk factors, such as high body mass indexes (BMI) and decreased blood flow to the heart, which were shown to be higher in veterans with PTSD than without.
- Research also showed that those with PTSD have significant differences in cardiac activity and reactivity to traumatic and non-traumatic activities, adding to evidence of dysfunction in physiological systems that may result in cardiovascular disease vulnerability.



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## Introduction

This annual scan of the military and veteran mental health and traumatic stress literature was produced by the Australian Centre for Posttraumatic Mental Health (ACPMH), for the Australian Government, Department of Veterans' Affairs (DVA). The aim is to provide a scan of the literature pertaining to key issues identified by DVA in conjunction with ACPMH. The review is an informed, rather than critical, review of the literature. The literature included in this scan has met the broad inclusion criteria based on regular standards of academic review, but a systematic evaluation of all published research during this time period has not been made. Where there are discrepancies in the literature, these will be discussed, but we caution the reader against assuming that a single paper is sufficient to provide conclusive information. We recommend the reader source the original papers if they are interested in particular findings.

## Background

In preparation for the 2013 annual literature scan, ACPMH consulted with DVA to identify the key topics on which to focus the review. These seven topics were identified as: (1) DSM-5 changes to posttraumatic stress disorder (PTSD) diagnostic criteria; (2) ICD-11 changes to PTSD diagnostic criteria; (3) Veterans and suicide; (4) Veteran family functioning and family and family descendant psychosocial outcomes; (5) Anger in veterans; (6) Veterans with sleep disturbance and (a) PTSD, (b) suicide, or (c) old age; and (7) PTSD and cardiovascular disease.

## Methodology

The methodology used in this 2013 literature scan included having a defined literature search strategy and an *a priori* inclusion/exclusion criteria.



## Literature search strategy

Topic area	Search terms
DSM-5 changes to PTSD criteria	DSM* AND PTSD diagnostic criteria OR trauma OR traumatic stress
ICD-11 changes to PTSD criteria	ICD* AND PTSD diagnostic criteria OR trauma OR traumatic stress
Veterans and suicide	suicide OR suicidal ideation AND veteran* OR combat OR military OR defence* or defense*
Veteran family functioning and family and family descendant psychosocial outcomes	family OR family functioning OR offspring OR child* OR descendant AND veteran* OR combat OR military OR defence* or defense*
Anger in veterans	anger AND veteran* OR combat OR military OR defence* or defense*
Veterans with sleep disturbance and (a) PTSD, (b) suicide, (c) old age	sleep AND veteran* OR combat OR military OR defence* or defense*
PTSD and cardiovascular disease	cardiovascular OR CVD OR myocardial OR heart AND veteran* OR combat OR military OR defence* or defense*

## Inclusion and exclusion criteria for papers

Papers included in the literature scan were selected according to inclusion and exclusion criteria. These are presented in Table 1. Two assessors provided quality assurance checks for the selection of papers. Papers which could not be agreed upon for inclusion were assessed by a third independent assessor, who also checked the final list of abstracts to be included in the summary. The total number of abstracts derived from the literature search contrasted with the number of papers selected for inclusion is seen in Table 2. The literature search strategy included a prioritisation of review papers in line with NHMRC guidelines for evidence review. That is, systematic reviews and meta-analyses were prioritised over general literature reviews. Priority was given to papers which were published in impactful and prominent journals such as *British Journal of Psychiatry*, *Journal of the American Medical Association*, *Archives of General Psychiatry* (now called *JAMA Psychiatry*), *American Journal of Psychology*, and *Lancet*. It is noted that online first articles that were available from 2013, published, or to be published in hard copy in 2014, were included. This is to ensure the most up to date literature is included in the 2013 review.

**Table 1. Inclusion and exclusion criteria for selected papers in the annual summary**

Inclusion criteria	Exclusion criteria
Literature published in 2013	Qualitative studies without empirical data
Studies reporting empirical data and findings	Single case studies
Studies published in high quality, impactful journals	Grey literature (e.g., reports, newsletters, conference proceedings)
Relevant review papers (e.g., systematic reviews, meta-analyses)	Studies with no relevance to veteran and military populations
Exceptional commentary pieces	Studies published in languages other than English
Papers drawn from other populations where findings are relevant to a veteran/military population	

**Table 2. Number of abstracts yielded from search and papers selected for annual summary**

Topic	Abstracts yielded	Papers included
DSM-5 changes to PTSD criteria	20	17
ICD-11 changes to PTSD criteria	6	4
Veterans and suicide	61	37
Veteran family functioning and family and family descendant psychosocial outcomes	59	20
Anger in veterans	21	6
Veterans with sleep disturbance and (a) PTSD, (b) suicide, (c) old age	45	19
PTSD and cardiovascular disease	32	13
<b>Total</b>	<b>244</b>	<b>117</b>



## Literature scan

### DSM-5 changes to PTSD diagnostic criteria

#### Overview of changes to PTSD diagnosis

In May 2013, the Diagnostic and Statistical Manual of Mental Disorders (DSM) 5<sup>th</sup> edition<sup>1</sup> was released with major revisions to the diagnosis of posttraumatic stress disorder (PTSD). Such changes included PTSD being moved from the Anxiety Disorders category into a new category called Trauma and Stressor-Related Disorders, the increase of the original 17 diagnostic symptoms to 20, and alterations to the criterion of what constitutes a traumatic event (referred to as Criterion A). In addition, the number of symptom clusters increased from three (B: *re-experiencing*, C: *avoidance and emotional numbing*, and D: *hyperarousal*) to four (B: *re-experiencing*, C: *active avoidance*, D: *negative alterations in cognitions and mood*, and E: *arousal and reactivity*). The table below summarises the major changes between DSM-IV and DSM-5. These differences are discussed extensively in the 2012 annual literature summary.

**Table 3. Key differences between DSM-IV and DSM-5 PTSD criteria**

Aspects of DSM-IV	DSM-5
Broader definition of what constitutes a traumatic event	More tightly defined, with the removal of some stressor events (e.g., unexpected deaths from natural causes) as well as the exclusion of learning about a traumatic event through electronic media such as television, video games, movies or pictures (unless exposure is work-related)
Stipulates the individual must have experienced an emotional response of intense fear, helplessness or horror during the traumatic event	This criterion has been removed
Three symptom clusters	Four symptom clusters distinguishing active avoidance from numbing symptoms
Minimum of six symptoms required for diagnosis	Minimum of six symptoms required for diagnosis
	Dysphoric mood symptoms added, including persistent distorted blame of self or others and persistent negative emotional state



## Changes to DSM-5 PTSD symptoms and impact on prevalence rates

Changes to the PTSD criteria could have an impact on prevalence rates of PTSD. One study using an online survey of United States (US) civilian adults (N= 2,953) found significantly lower lifetime prevalence rates of PTSD when using DSM-5 criteria (9%) compared to DSM-IV (11%)<sup>2</sup>. However, past 12 months and past 6 months rates were not significantly different. The authors attributed this finding to the exclusion of sudden, unexpected death not due to violence in Criterion A, which was found to account for 50% of all discrepant cases.

A second study found comparable results when the prevalence of PTSD among US civilian adults was compared to a sample of US veterans (N= 345)<sup>3</sup>. In both samples, while PTSD prevalence estimates differed when DSM-5 and DSM-IV criteria were applied, these differences were negligible. As yet, there is insufficient evidence to indicate comprehensively how prevalence rates of PTSD will shift with the introduction of the DSM-5 changes.

## Implications of DSM-5 changes to diagnostic criteria

Several studies noted that whilst the modifications to the PTSD criteria in the DSM-5 may not dramatically alter the prevalence of PTSD, they will increase the heterogeneity of individuals with a PTSD diagnosis<sup>4-6</sup>. Reasons for this increase include altered criteria for traumatic events, addition of symptoms that commonly occur in other disorders such as depression, borderline personality disorder and dissociative disorders, and the increased number of possible symptom combinations. As such, it has been suggested that the diagnostic changes may have significant legal implications including difficulties in differential diagnosis, ease of malingering, and continued confusion regarding criteria for a traumatic stressor. A recent editorial calls for additional studies to examine these potential implications in both veteran and non-veteran populations<sup>7</sup>.

## The structure of PTSD

Researchers have previously established that the true spread of PTSD symptoms maps poorly onto the DSM-IV three-factor model<sup>8</sup>. Using statistical modelling, some research in 2013 indicated that neither the DSM-IV three-factor nor the DSM-5 four-factor models truly capture the symptom spread of PTSD, which instead consists of a five-factor model<sup>8-11</sup>. The five factor model consists of the same factors in the four factor model except the arousal cluster in the four factor model is split into an anxious arousal and dysphoric arousal factor. Other research in 2013 continued to support a four-factor



model reflected in DSM-5<sup>12,13,14</sup>. Disagreements over the true underlying structure of PTSD are likely to continue and inform future diagnostic decisions.

Several studies in 2013 confirmed the existence of a dissociative subtype of PTSD recognised in DSM-5. A literature review found supporting evidence from epidemiological and neuroimaging studies<sup>15</sup>. Epidemiologic data in a large scale study indicated that 14% of respondents with 12-month DSM-IV PTSD also experienced dissociative symptoms, supporting the notion that the presence of these symptoms represents a distinct, severe, and impairing subtype of PTSD<sup>16</sup>.



## ICD-11 changes to PTSD criteria

The 11<sup>th</sup> version of the International Classification for Disorders (ICD-11), a diagnostic tool used worldwide to classify diseases and disorders, is due for completion in 2015. ICD-10 was the first version to see the inclusion of PTSD, and the working party for the 11<sup>th</sup> edition has proposed a number of changes to the diagnostic criteria and classification of PTSD<sup>17</sup>. In 2013, three expert reviews of the proposed changes and two studies were published. It should be noted that the working party recommendations were only published in 2013, meaning it is likely that more research concerning the changes will be published in 2014 and later years.

### Proposed changes

Several changes to disorders associated with stress have been proposed for ICD-11. First, the working party has proposed grouping PTSD and related disorders separately from anxiety disorders in the category of 'disorders specifically associated with stress'<sup>17</sup>. Secondly, the symptom requirements for PTSD have been tightened. The ICD-11 working party aimed to identify the symptoms unique to the PTSD construct, avoiding symptoms that overlap with other disorders, such as depression. The proposed criteria comprise three clusters with only two symptoms in each cluster: cluster 1: re-experiencing the traumatic event (flashbacks and nightmares); cluster 2: avoidance of reminders likely to produce re-experiencing (avoidance of thoughts and things); cluster 3: excessive sense of current threat (hypervigilance and startle)<sup>17,18</sup>.

In addition, the inclusion of complex PTSD as a separate disorder has been proposed. (The DSM-5 working party, in comparison, concluded there was insufficient evidence to support the inclusion of complex PTSD.) Complex PTSD may occur after experiencing severe and prolonged or multiple traumas, such as childhood abuse or torture<sup>17</sup>. The working party for ICD-11 has proposed that complex PTSD consists of the above mentioned three core elements of PTSD, in addition to enduring disturbances in affect, self and interpersonal relationships<sup>18</sup>. This hierarchical relationship with PTSD means that to be diagnosed with complex PTSD, an individual must meet the criteria for PTSD, in addition to complex PTSD specific criteria<sup>19</sup>.

Other proposed changes to ICD-11 include the addition of prolonged grief disorder as a new diagnosis, where an individual experiences an abnormally persistent and disabling response to a death<sup>17</sup>. New updates have also been proposed for adjustment disorder in that the criteria have been redefined and previous subtypes described in ICD-10 have been removed<sup>17</sup>. The working party also proposed that acute stress reaction, known as



acute stress disorder in DSM-5 and which is sometimes considered a pre-cursor to PTSD, is no longer needed. While the DSM-5 stipulates that PTSD cannot be diagnosed after one month of the traumatic experience, ICD-10/11 have no such time limits, and the need for a diagnosis to capture this early period post-trauma was put in doubt. Instead, it has been proposed as a normal reaction and has been moved to a different diagnostic category which is not for diseases or disorders but for reasons why a health encounter may occur<sup>17</sup>.

## Effect of proposed changes

Two studies in 2013 investigated the impact of the proposed ICD-11 changes. One study sought to validate the ICD-11 proposed distinction of complex PTSD and PTSD<sup>20</sup>. In a study of 302 US adults (89% women) seeking treatment for trauma, latent profile analysis was used to identify potential subgroups of individuals based on their symptoms. The analysis identified that individuals fell into one of three groups: complex PTSD, PTSD, and a low symptom group. Type of trauma experienced was not sufficient to distinguish between groups.

A second study compared differences in prevalence rates between ICD-10 and ICD-11 proposed criteria. In a sample of 229 Austrian adults (77% male) who were victims of child abuse through the Catholic Church, ICD-10 and ICD-11 criteria were applied to investigate rates of PTSD and complex PTSD<sup>19</sup>. Sixty-eight per cent had experienced physical abuse, 84% emotional abuse, and 70% sexual abuse. ICD-10 rates of PTSD were 53%. ICD-11 rates were 17% for PTSD and 21% for complex PTSD. The higher rates of complex PTSD than PTSD were expected given the nature of the trauma the participants had suffered. However, nearly 30% of the sample met all of the complex PTSD criteria but failed to meet the requisite PTSD criteria, and thus were defined as having neither. The authors note that this may reflect complex PTSD as a distinct, but overlapping disorder, and the hierarchical system of diagnosis proposed for ICD-11 may be sub-optimal. When the authors created two sub-threshold levels for the PTSD-specific criteria in complex PTSD, rates of overall PTSD based on ICD-11 rates rose significantly (48 - 54%) and were comparable to the ICD-10 rate (53%). In this study, the gender bias of higher PTSD rates in women was preserved in the ICD-10 rates, and in the ICD-11 complex PTSD rates. Interestingly, it disappeared for ICD-11 PTSD rates. The authors propose that traditional gender bias in PTSD may be due to the types of samples typically collected in trauma research, which predominately feature traumatised female samples, whereas this study sample comprised 77% males.



## Suicide and veterans

Suicide-related features include suicidal ideation<sup>\*</sup>, planning to commit suicide, obtaining means for completing suicide, attempting to kill oneself, and the act of suicide<sup>21</sup>. After a stable rate of suicidality between the 1970s and early 2000s, rates of suicide in the US Army have increased by about 80% between 2004-2008 to surpass civilian rates<sup>22</sup>. A large number of articles investigated various suicide-related behaviours in military samples in 2013. These articles investigated a vast range of characteristics that may be associated with suicide risk in military and veteran populations such as: anatomical brain differences<sup>23</sup>; frequency of negative social exchanges<sup>24</sup>; marital status and interpersonal conflict<sup>25</sup>; adjustment disorder and alexithymia<sup>†26</sup>; sense of burdensomeness<sup>27</sup>; body mass indexes<sup>28</sup>; vitamin D levels<sup>29</sup>; levels of shame and/or pride<sup>30-32</sup>; use of different antipsychotics for bipolar disorder<sup>33</sup>; and resilience<sup>34,35</sup>. In addition, literature in 2013 investigated suicidal behaviour prevalence rates in specific populations such as military personnel released from hospital<sup>36</sup>; amongst different military occupations<sup>37</sup>; between female veterans and non-veterans<sup>38</sup>; in Finnish military conscripts<sup>39</sup>; in veterans with gender identity disorder<sup>40</sup>; and in veterans recently discharged from nursing homes<sup>41</sup>. Studies published in 2013 that are most relevant to DVA interests have been selected for in-depth discussion below.

It is important to note that all studies reported here used US military or veteran data. Relevance to Australian military or veteran populations cannot be assumed. For example, a study found that suicide attempts in the US military are more likely to result in death compared to civilian attempts<sup>42</sup>. This effect may be partly attributable to the finding that the military attempts were more likely to involve firearms, which are typically more lethal than other suicide methods. While Australian military personnel are more likely to have access to firearms than Australian civilians, the US study also found that 78% of firearm suicides amongst military personnel were conducted using privately owned firearms. Private ownership of firearms is significantly more regulated in Australia compared to the US.

Several studies which investigated the prevalence of suicide in veterans are worthy of mention. In a sample of 1,962 US male veterans over the age of 60 who were surveyed during 2011, 6% were currently contemplating suicide and the majority of these were not receiving mental health treatment<sup>43</sup>. Studies also show that suicide risk may be higher for veterans with specific mental health problems. In a review of all male US veterans affairs healthcare users in 1999 (N= 2,962,810), it was found that of those who

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<sup>\*</sup> Thinking about killing oneself

<sup>†</sup> A personality trait characterised by an inability to identify, describe and distinguish own and other's emotions



committed suicide between 2000 and 2006 (n= 7,426), nearly half had at least one mental health disorder<sup>44</sup>. A 2013 study of 1,340 US Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans who screened positive for depression in 2008–2009 found that one third reported suicidal ideation<sup>45</sup>. Suicidal ideation rates were higher amongst those with multiple mental health disorders.

Amongst veterans who have attempted suicide, multiple suicide attempt prevalence rates are also high. For example, in military personnel admitted to military hospitals for suicide attempts between 2001–2006, 40% had multiple suicide attempts documented, and these individuals were more likely to have problem substance use, mood, substance and personality disorder diagnose than those with a single suicide attempt<sup>46</sup>. In a small 2013 study of 72 US active duty military personnel who attempted suicide, a range of reasons were reported, but the primary reasons reported for attempting suicide was to escape from intense psychological or emotional suffering, which are comparable reasons to those reported by civilian populations<sup>47</sup>.

## Individual risk factors

Individual risk factors refer to variables that are unique to an individual and which are non-military related. Suicide acceptability, or the belief that suicide is acceptable in certain circumstances, was investigated in veterans to determine if rates were higher in veterans compared to non-veterans<sup>48</sup>. Suicide acceptability was determined by the endorsement of the following scenarios: do you think a person has the right to end his or her own life if this person: (a) has an incurable disease; (b) has gone bankrupt; (c) has dishonoured his or her family; or (d) is tired of living and is ready to die. Results showed that veterans were no more likely to endorse suicide acceptability in the four scenarios than non-veterans. However, the authors note that suicide acceptability might be higher in specific sub-populations of veterans, such as younger veterans; Lesbian, Gay, Bisexual, or Transgender (LGBT) veterans; or those seeking medical care.

Research in 2013 indicated that pre-military events may be related to risk of suicide. For example, among 525 veterans and active duty military personnel, half of those who had made a suicide attempt during or after military service experienced suicidal ideation prior to joining the military and 17–25% made a suicide attempt prior to joining<sup>49</sup>. The authors propose that some individuals have persistent, trait-like vulnerabilities to suicidal behaviours, and that pre-military risk factors play an important role in military and veteran suicides. Another study of current and former Marines investigated stress and trauma, such as childhood abuse and adult sexual assault, that occurred pre-recruit training and post-recruit training<sup>50</sup>. The Marines were followed up 10 years later (N=680) and suicide attempts since recruit training were assessed. Pre-military stress and trauma



variables, such as childhood abuse, were strong predictors of suicide attempts over the 10 year follow-up. In addition, suicide attempts prior to recruit training were strongly associated with attempts 10 years later, adding to findings that suicidal behaviour may be persistent and trait-like. A third study found that childhood trauma predicted suicidal ideation in OEF/OIF military personnel and veterans<sup>35</sup>. All three studies recommend the evaluation of childhood trauma in assessment of risk of suicidal behaviours in military personnel and veterans.

## Military-related risk factors

An investigation into the relationship between suicide and military factors was conducted on data collected in the Millennium Cohort Study, a prospective longitudinal study comprising 151,568 US military personnel who served during the OEF/OIF operations<sup>51</sup>. Results showed that specific-deployment related characteristics, such as length of deployment, number of deployments, or combat experiences were not directly associated with increased suicide risk. Individual factors, such as being male and having a mental health disorder such as bipolar disorder, depression and alcohol problems, were related to suicide risk.

The findings are mixed with respect to whether combat-related exposure is a risk factor for suicidal behaviour. For example, one study of 1,962 US male veterans over the age of 60 found that suicidal ideation was more than twice as high in combat-exposed veterans (9%) compared to non-combat veterans (4%)<sup>43</sup>. Another study investigated the relationship in two samples of deployed military personnel: 348 US Air Force personnel deployed to OIF and 219 US deployed military personnel to OIF undergoing psychological evaluation for suspected traumatic brain injury<sup>52</sup>. Results showed that combat exposure was not related to suicide risk in either sample. However, more combat exposure was linked with increased fearlessness about death and PTSD symptom severity, both of which are linked to suicide risk. The authors conclude that the link between combat exposure and suicide risk may not be as robust as speculated by some researchers.

A second study found that age may influence the relationship between combat exposure and suicide<sup>53</sup>. The authors noted that previous studies that report a link often have samples with veterans over 30 years of age whereas studies with non-significant links are based on younger veterans. Suicidal behaviour was measured in 273 US active duty Air Force personnel, of which 92% had been deployed to OEF/OIF. Results showed that the relationship between combat exposure and suicidal behaviour was strongest after age 34. The authors propose that combat exposure may change contextually over time and while combat experiences may be normalised at a younger age while the veteran is



deployed, they may become more abnormal with age, especially if veterans become isolated or disconnected from other veterans, which in turn increases suicide risk.

There is some evidence to suggest that those who experience a mild traumatic brain injury (mTBI) might be at increased risk for suicidal behaviours<sup>54</sup>. One study in 2013 sought to investigate whether particular features of mTBI may influence the relationship between mTBI and suicide risk<sup>55</sup>. In a sample of 155 US military personnel currently serving in OIF who were referred to a TBI outpatient clinic, suicidal behaviour was reported in 16% of the veterans who were diagnosed with a mTBI (n= 135) and none of the veterans who did not meet TBI criteria (n= 23). Most participants (76%) were seen within seven days of sustaining the mTBI. Longer duration of loss of consciousness during the mTBI was related to a decreased likelihood of suicidal behaviour which conflicts with previous findings. However, the early stage at which these assessments occurred (within 7 days post-injury) may mean that the relationship between suicidal behaviour and loss of consciousness may differ depending upon when the psychological assessment is conducted. A second study using the same sample described above found that suicide risk is higher amongst military personnel who have experienced more lifetime TBIs, indicating a cumulative risk of subsequent TBIs on suicide risk<sup>56</sup>. However, the cross-sectional nature of the study limits the ability to establish causality.

## The relationship between PTSD and suicide

Several studies investigated the role of PTSD in suicide. A systematic review published in 2013 looked at the relationship between PTSD and suicidal behaviour in veterans<sup>57</sup>. Results of the review showed that PTSD is associated with significant increased risk for suicidal behaviour in veterans. Another 2013 study found that PTSD was associated with suicidal ideation in both combat and non-combat veterans<sup>43</sup>.

## Methods of reducing veteran suicides

In a study of 346 US veterans admitted to a residential program for treatment of PTSD, the effect of exercising on suicide risk was investigated<sup>58</sup>. Exercise was found to decrease suicide risk, and higher levels of exercise were associated with lower depression symptoms and higher levels of sleep quality, both of which in turn are associated with lower suicide risk.

Another investigation explored the quality of suicide risk assessment, if any, that was provided to 488 US veteran patients of the Veterans Health Administration (VHA) with depression who committed suicide between 1999 and 2004<sup>59</sup>. Results showed that 70% of those who died by suicide did not have a documented assessment for suicidal



ideation at their final VHA visit prior to their death, even for instances where the visit occurred within seven days of the suicide. Additionally, 85% of veterans who committed suicide denied suicidal ideation when they were assessed at their final visit. This finding highlights the large challenge of how to reliably assess suicidal ideation in veterans with depression.

VHA went through a process of enhancing mental health programs and increasing outpatient mental health staffing by 53% between 2005 and 2009<sup>60</sup>. The study found changes in the suicide rates in proportion to changes in VHA mental health outpatient staffing. Centres with the greatest increases in staffing had decreases in suicide rates of 11 to 13% whereas those with the lowest increases in staffing had increases in suicide rates of 14 to 16%. The authors calculated that for an average centre, a 28 to 37% increase in outpatient staffing over previous levels (i.e., those observed in 2005) would be needed to decrease suicide rates by 10%.

In summary, while for the past decade the VHA has implemented strategies to combat veteran suicide rates, 2013 evaluations of some of these changes show that they may not be meeting their objective. On the basis of these studies, improved detection of suicidal ideation and increased staffing of mental health services are needed to reduce suicide rates. The large number of articles published on veteran suicide in 2013 (n= 61) is concordant with the concern that has followed increased awareness of veteran suicide rates, and as the contemporary Middle East conflicts draw to an end, this will likely remain a key area of research in the future.



## Veteran family functioning and family descendant psychosocial outcomes

DVA research into Australian veterans who served in Timor-Leste and who were listed as being in a relationship in 2010 reported on average 1.5 children living at home, with an average age of 11 years<sup>61</sup>. Data from the Australian Defence Force (ADF) indicates that in 2011, there were more than 30,000 recognised partners of ADF members and over 18,000 children under the age of 18 in the care of ADF members<sup>62</sup>. As such, a greater understanding of veteran family functioning and family descendant psychosocial outcomes is highly relevant to DVA.

### Military family functioning

Military families have unique qualities that can impact levels of family functioning. Aspects of military employment such as the presence of a stable job by at least one caregiver, access to comprehensive healthcare and subsidised housing, and experience in a community that promotes resilience and strength in the face of adversity, can positively impact on family functioning,. However, there are also several challenges military families routinely face that can significantly negatively impact family functioning. Military families are typically highly mobile, often moving every two to three years, which can be a stressful experience<sup>63</sup>. In addition, many military families have to cope with the experience of deployment, including multiple deployments, with extended absences of a loved one.

US data shows that historically, only 15% of Vietnam veterans were parents during deployment, whereas now, 44% of active duty members are parents<sup>64</sup>. In addition, more women are serving in the military nowadays than in the past. This shift in military family demographics means that more offspring of veterans experience the stress associated with one, or in some cases both, parents being deployed. Some veteran fathers may be deployed when their child is born, or while children are very young, and need to bond or renew bonds with their children upon return<sup>65</sup>. In addition, contemporary conflicts have resulted in higher rates of injury survival than previous conflicts, meaning that many current families have to cope with injuries sustained by their loved one. These injuries can cause veterans and their families to have to deal with long-term recovery, permanent disability and the veteran's psychological reactions to these experiences<sup>66</sup>.

Research in 2013 produced a number of literature reviews or theoretical discussions on various aspects of military families, all of which concluded that more research into military family functioning was needed<sup>67-74</sup>. A narrative review of studies on family



functioning in military families during overseas deployment, after exposure to combat or experiencing or participating in violence during deployment, and after service member injury, disability and combat-related PTSD, suggests that all had profound impacts on family functioning<sup>71</sup>. The review drew on past research which suggested that these experiences increase the likelihood of: divorce; domestic violence; decreased relationship satisfaction; increased physical and mental health problems for the spouse, children and family of origin of the service member; and increased caregiver burden. The review also suggest that these outcomes may persist for the lifetime of family members<sup>71</sup>.

It is also important to note that family functioning perceptions may differ for each family member. In a study of 91 parent-adolescent relationships from US Army families which had experienced on average more than two deployments, adolescents consistently rated family functioning at lower levels compared to parent ratings, although there was a relationship between parent and adolescent family functioning ratings<sup>75</sup>. Interestingly, the lowest parent and adolescent rating for family functioning was observed in families who had experienced no deployments.

## Effects of familial military connections on offspring

In a study of over 14,000 Californian students in 7<sup>th</sup> to 11<sup>th</sup> grade, adolescents who were military-connected (i.e., with a parent or sibling in the military) had poorer psychosocial health than adolescents who were not military-connected<sup>76</sup>. Specifically, 34% of adolescents with a parent and 35% with a sibling in the military reported feeling sad or hopeless for more than two weeks in the past 12 months and 25% of adolescents with a parent in the military and 26% of adolescents with a sibling in the military reported having seriously considered attempting suicide. In comparison, non-military connected adolescents reported rates of feeling sad/hopeless or considering suicide at 31% and 19%, respectively. Military-connected adolescents also reported poorer wellbeing, including more depressive symptoms, compared with their non-military-connected peers. However, this study was limited by the fact that socio-economic status was not controlled for, which is an established risk factor for psychological health. It is also important to note that this study, as with the majority of 2013 studies in this area, involved samples of primarily US National Guard members, which comprise part of the US Reserve force. This may reduce the applicability of these findings to the families of permanent military personnel.



## Effects of deployment on military offspring

The demographics of modern military families are shifting, with more children being born prior to, and during deployment, than in previous conflicts. Several studies in 2013 investigated the effects of deployment on offspring in military families. Results from the same study described above showed that adolescents from military families who experienced parent or sibling deployments were more likely to report depressive symptoms and suicidal ideation compared to those with no familial deployment<sup>76</sup>.

A second study using the same sample looked at substance use rates in adolescents with parents in the military, siblings in the military and those with non-military families. The results showed that adolescents in military families (i.e., with either a parent or sibling in the military) have a higher prevalence of substance use than those with non-military families<sup>77</sup>. The highest rate of lifetime substance use in adolescents was found in those with a sibling in the military whereas the highest rates of recent drug use was found in those who reported having a parent in their family serving in the military. However, after controlling for adolescent school grade, gender, and race, being from a military family alone was not associated with lifetime or recent substance use; but having more family member deployments was. The stress associated with deployments may account for the association with greater levels of substance use<sup>77</sup>.

A third study also found a relationship between substance use and deployment. In a study of over 75,000 US 6<sup>th</sup> to 11<sup>th</sup> graders surveyed in 2010, the rate of alcohol use, binge drinking, marijuana use, other illegal drug use, and prescription drug misuse were found to be greater for children of currently or recently deployed parents than for children of parents who were not in the military<sup>78</sup>. This effect was strongest in the youths that did not live with their immediate family. Deployment was also related to increased likelihood of the child living with someone other than their parents, and this disruption to living arrangements and absence of parent(s) may contribute to the high levels of substance use seen in this group. The majority of military families in this study were Reserve or National Guard. Several factors that can influence substance use, such as socio-economic status, family characteristics, or mental health status were not considered, meaning that increased substance use in the military family may not be attributable to deployment<sup>78</sup>.

The quality and frequency of communication by military parents during deployment may ameliorate or exacerbate offspring outcomes. In a small study of National Guard members and their families who were deployed during OIF (N=26), the high communication frequency and quality was associated with emotional and behavioural



problems during deployment<sup>79</sup>. The authors suggest that offspring with more emotional and behavioural problems may seek out more communication with a deployed parent<sup>79</sup>.

## Post-deployment effects on military offspring

In addition to the stressors that offspring experience during deployment, military families can also experience stressors upon a deployed parent's return. In a sample of US National Guard members and their partners, rates of hazardous drinking, depression and familial/marital functioning were investigated 45 to 90 days post-deployment<sup>80</sup>. 1,143 National Guard members and 674 of their partners responded to the survey, resulting in 661 linked couples. Hazardous drinking rates in spouses of military members (96% women) were 11%, compared to the civilian rates of 8%. However, while hazardous drinking had a negative impact on the couple's satisfaction with their relationship, hazardous drinking in service members was associated with less parenting stress for the spouse. Depression in the service member or the spouse was more closely related to negative family outcomes than alcohol.

Family functioning after returning from deployment when a veteran has a mental health problem is likely to be influenced by a number of factors, including the coping style of the veteran. In a study of nearly 3,000 US veterans who served in Operation Desert Shield (ODS), coping style and PTSD symptoms and their impact on family functioning after returning from deployment were investigated<sup>81</sup>. Avoidant coping was strongly related to PTSD symptoms which negatively impacted family functioning. In comparison, approach coping (such as problem solving and other adaptive behaviours) was related to lower PTSD symptoms and positively related to family functioning.

## Veteran parents' mental health status

While pre-, peri-, and post-deployment periods place unique stressors on a military family, veterans may face ongoing mental health issues even after leaving the military, which in turn can significantly impact on family members. In a systematic review of studies of the parenting styles of both veteran and non-veteran parents with PTSD, results showed that parents with PTSD were more likely to use hostile parenting tactics, including violence and angry outbursts, in addition to being less engaged and having less affective involvement with their offspring<sup>69</sup>. Of note, maternal PTSD was more strongly associated with higher offspring PTSD symptom levels compared with paternal PTSD.

Other research in 2013 also found a link between veteran mental health and their offspring's mental health and family functioning. One study examined a sample of



psychiatrically hospitalised adolescent offspring of Croatian male PTSD veterans. Suicide attempts amongst the offspring was 62% and these attempts were related to self-reported poor family functioning<sup>82</sup>. However, the lack of a control group limits the interpretation of this study, specifically in terms of the role of the veteran parent's PTSD in the adolescent's severe mental health issues and whether the rates of suicide attempts differ significantly from adolescents without veteran parents with PTSD.

A similar study compared a sample of adolescents born of veterans diagnosed with PTSD (n=122), with a control group of adolescents born of veterans without PTSD (n=122)<sup>83</sup>. All adolescents were drawn from referrals to an outpatient psychiatric hospital, and thus all presented with clinical concerns. Results showed that the offspring of veterans with PTSD were more likely to report emotional and behavioural problems, such as more anxious or depressive symptoms, more attention problems, and more delinquent and aggressive behaviour. Offspring of veterans with PTSD were also almost three times more likely to report somatic symptoms than control subjects which authors suggest indicates that offspring may mimic their veteran parent's PTSD symptoms. Offspring perceptions of poor family functioning accounted for 20% of the variance in the internalising symptoms but did not significantly predict externalising symptoms. The authors propose that family dysfunction in families where a parent has PTSD may be a secondary phenomenon arising from the PTSD symptoms. It is important to note, however, that all adolescents in this sample were drawn from outpatient treatment and were presenting with a range of clinical problems. As such, this group is most likely not representative of all offspring with a parent suffering from PTSD, and whether there are differences in rates of psychosocial problems between offspring from veteran parents with and without PTSD remains unclear.



## Anger in veterans

Anger can be considered as a negative, internal feeling state associated with specific cognitive and perceptual distortions (e.g., misappraisals; attributions of blame)<sup>84</sup>. Anger is distinct from the related concept of aggression, which consists of behaviours that are intended to cause harm to another person<sup>85</sup>. Previous research has found that anger in contemporary veterans may be a significant problem, affecting up to 57% of US OEF/OIF veterans<sup>86</sup>. Not many studies in 2013 investigated anger in veterans although the majority of these studies investigated anger in contemporary veterans.

## Anger in relation to co-morbid psychopathology

### PTSD

Anger and PTSD have a strong relationship, particularly in military populations<sup>87</sup>. Research in 2013 indicated that anger remains a major problem for veterans with PTSD. In a study of Australian veterans (66% Vietnam veterans) with PTSD receiving cognitive processing therapy, the impact of comorbidities such as depression, anxiety, alcohol use and anger upon treatment outcomes was investigated<sup>88</sup>. Of these comorbidities, only anger predicted response to PTSD treatment, with severe anger associated with reduced treatment outcomes. In another US study, over 1,000 veterans (43% OEF/OIF) starting treatment for PTSD were asked to nominate which two or three problems they most wanted to improve through treatment<sup>89</sup>. The most commonly reported concern was anger, with 31–34% of veterans reporting wanting to reduce their anger. It was found that men were more likely than women to report concerns with anger, although it should be noted that only 13% of sample were women. These findings reinforce the importance of assessing and (where required) targeting anger, when treating veterans for PTSD.

While anger has been established as closely related to PTSD, a recent study sought to investigate whether depression mediates the relationship. Ninety-eight US veterans with PTSD, who served primarily in Vietnam or contemporary Middle East conflicts, were assessed for depression, state and trait anger<sup>90</sup>. State anger is considered a transient experience while trait anger is thought to represent an underlying, stable predisposition to react with anger to various situations<sup>91</sup>. The results showed that depression partially accounted for the relationship between PTSD and state anger, while the numbing and dysphoria clusters of PTSD impacted trait anger. These findings indicate that the experience of trauma, which can result in depression, can then in turn increase levels of state anger. In comparison, key symptoms of PTSD, which are often experienced in a chronic way, may impact on trait anger<sup>90</sup>. This finding may be particularly pertinent as



the sample consisted primarily of older veterans, who have experienced chronic PTSD for long durations. These findings suggest that treatment targeting PTSD as well as depression symptoms may potentially reduce anger levels.

### **Traumatic Brain Injury (TBI)**

Research has shown that personality and behavioural changes have been reported after sustaining a TBI, including changes in levels of anger and aggression<sup>92</sup>. A small study (n=24) found that veterans who had sustained a mild TBI (mTBI) through blast force had more anger and frustration than veterans who sustained an mTBI from blunt force<sup>93</sup>. However, due to the cross-sectional, retrospective nature of the study, it is unclear if the higher levels of anger in those who experienced a blast-force mTBI are due to the nature of the injury (such as the concussive waves of a blast-force injury disrupting cortical integrity), or psychosocial or emotional factors which may have occurred during or post-injury<sup>93</sup>. With the high rates of improvised explosive device use in the contemporary Middle East conflicts, blast-force mTBI exposure may be a factor contributing to the higher rates of anger reported in this group of veterans compared to earlier theatre veterans.

### **Treatment outcomes on anger**

Three studies in 2013 targeted anger treatment in veterans. Two of these studies directly targeted reductions in anger levels in veterans with various psychological disorders, and a third study reported on treatment targeting mood states of veterans with PTSD, where anger was a secondary outcome. Cognitive behavioural therapy (CBT) was used in the two studies aimed at reducing reduce anger levels in veterans. In a small sample of US male veterans returning from OEF/OIF operations after experiencing a deployment-related trauma who presented with anger problems (N=25), one study found that a CBT intervention provided larger treatment gains for anger than an active control group (combined psychoeducation, relaxation and support intervention), and these gains were sustained at a three-month follow-up<sup>94</sup>. There was also significantly more improvement in interpersonal functioning for the treatment group. The results should be interpreted cautiously however, as the study is limited by a small sample size in each group. In a second study using a small sample of veterans with self-reported aggressive and risky driving problems (N=9), a CBT intervention specifically designed to reduce driving-related anger, aggression and risky driving was administered to all veterans<sup>95</sup>. Half of the veterans in this sample had served in Vietnam. After treatment, 90% of participants demonstrated reliable reduction in driving-related aggressive behaviour, while 67% demonstrated reliable reduction in driving-related anger. However, the study is limited by the small sample size and the lack of a control group. While the findings from these



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small studies are promising, rigorous, large-scale studies looking at treatment of veterans with anger problems in the context of comorbid mental health conditions are needed.

One randomised controlled trial of treatment also reported on the results of using Mindfulness-based Stress Reduction (MSBR) to improve the mood state of 62 Iranian combat veterans with PTSD<sup>96</sup>. Anger was examined as a secondary treatment outcome. While there was a reduction in depression, dizziness, fatigue and tension in the treatment group after therapy compared to controls, there were no differences in anger levels between the pre- and post-treatment assessments. It is difficult to know whether this particular intervention isn't useful for anger or whether targeting anger indirectly is not useful. Regardless, the conclusion from these studies is that although anger is an identified problem for veterans, further research is required to identify best ways to target anger, especially when it is comorbid with mental health disorders.



## Veterans with sleep disturbance and (a) PTSD, (b) suicide, (c) older age

### Veterans with sleep disturbance and PTSD

Sleep disturbances are an inherent part of the military lifestyle<sup>97</sup>. For serving personnel, round-the-clock operations can produce acute and chronic sleep deprivation levels. Shift work schedules also disrupt circadian patterns, which exacerbate sleep disturbances in this population<sup>98</sup>. DSM-5 recognises 10 conditions that constitute sleep-wake disorders<sup>99</sup>. Core features include reduced sleep quality, timing, quantity, and related daytime distress and impairment<sup>100</sup>. The majority of the studies examining sleep disorders among veteran populations that were published in 2013 focussed on the broader assessment of sleep disturbance, insomnia and nightmares (that may or may not be PTSD-related).

### Pre-deployment sleep problems and PTSD

Sleep disturbances have long been considered a result of deployment or service-related disorders such as depression, pain, PTSD and TBI<sup>97,98,101</sup>. Several 2013 studies support an alternate causal relationship, with pre-deployment sleep problems found to influence the severity of sleep disturbances and associated psychiatric symptoms that develop during and after deployment<sup>102-104</sup>. Hence, there is potential for sleep disorders to exacerbate the deployment experience and contribute further to traumatic stress reactions including PTSD, depression and suicide<sup>101,105,106</sup>. This reciprocal relationship between sleep disturbance, deployment experience and psychiatric symptoms has implications for all veterans, and for service personnel undergoing multiple deployments over time.

Several studies looked at pre-deployment histories of sleep disturbance, and the influence this had on the subsequent development of PTSD<sup>102-104</sup>. For example, a prospective longitudinal study<sup>103</sup> conducted over a two-year period with soldiers deployed to Iraq (N= 172) found pre-deployment sleep complaints contributed significantly to the prediction of PTSD and depression up to two years after deployment. In another prospective longitudinal cohort study involving 453 Dutch service members deployed to Afghanistan, pre-deployment nightmares were found to predict PTSD symptoms at 6 months, while pre-deployment insomnia complaints did not<sup>102</sup>. With nightmares one of the hallmarks of PTSD, it is not surprising that pre-deployment nightmares were associated with an increased risk for the development of PTSD symptoms. This was attributed to the occurrence of nightmares during REM sleep and



the manner in which they hamper fear extinction and memory consolidation. In a second large-scale longitudinal cohort study with US personnel deployed over 2001 to 2008 (N=15,204), it was found that pre-deployment insomnia symptoms and combat-related trauma were significantly associated with higher odds of developing PTSD, depression, and anxiety post-deployment<sup>104</sup>. Taken together, these results suggest that insomnia and nightmare symptoms may be important predictors for the development and/or exacerbation of mental health problems following deployments.

### **Post-deployment sleep problems and PTSD**

In 2013, several studies examined the relationship between post-deployment sleep problems and PTSD. An observational, longitudinal study of veterans post-deployment (n=80) found that insomnia was associated with significantly higher PTSD and depression severity both at baseline and six months<sup>107</sup>. The presence of nightmares was associated with significantly higher PTSD severity at both time points and with depression severity at baseline only. Despite decreases in PTSD and depression severity over time, insomnia severity was relatively unchanged after six months. The prevalence and severity of nightmare complaints diminished modestly over time. The authors concluded that while insomnia and PTSD are closely linked, there is evidence to suggest treatment may need to address insomnia independently of PTSD symptoms.

### **Treatments for sleep disturbances and PTSD**

Several papers published in 2013 indicated that psychological treatments can have positive results in reducing deployment related sleep disruption among serving personnel and veterans. A study tested the effectiveness of combined CBT for insomnia (CBTI) and adjunctive imagery rehearsal therapy (IRT) to improve sleep as well as PTSD symptoms<sup>108</sup>. IRT was used to directly target nightmares while CBTI was used to target insomnia. OEF/OIF combat veterans (n=40) with PTSD and insomnia were randomised to four sessions of CBTI and IRT or a waitlist control. Two thirds of the veterans had nightmares and received the adjunctive IRT treatment. Veterans at post-treatment in the CBT/IRT group reported improved sleep, reduced PTSD symptom severity and fewer PTSD-related night time symptoms compared to the waitlist control group. The authors suggested that the combined treatment holds promise for reducing both insomnia and PTSD symptoms amongst combat veterans, although they cautioned that the influence of IRT on the efficacy of the combined treatments needs to be further examined (as not all veterans received this)<sup>108</sup>.

In another study, a brief, preference-based non-medication insomnia treatment was trialled for OEF/OIF veterans (N=41) who experienced blast and/or other injuries



resulting in an altered level of consciousness (possible mTBI)<sup>109</sup>. The treatment consisted of one in-person and three telephone sessions of behavioural intervention as supported by electronic delivery of components of intervention. The pilot study used a single-group pre-post design with a 3-month follow-up assessment. It was found that the in-person treatments were used more often than the electronic methods, and that insomnia decreased from moderate severity to the sub-threshold range over the course of the intervention, with large treatment effect sizes for sleep outcomes seen across the pre-post testing periods. The improvements in sleep quality were maintained at the 3-month follow-up. Although the authors noted that this brief insomnia treatment needed to be tested under randomised controlled trial conditions, this intervention showed promise in treating insomnia<sup>109</sup>.

## Veterans with sleep disturbance and suicide

As previously noted, insomnia is a common issue for military personnel. In turn, insomnia can exacerbate the deployment experience and is a risk factor for traumatic stress reactions such as PTSD, depression, and suicide<sup>101</sup>. Two studies published in 2013 closely examined the relationship between insomnia and suicidal ideation among a sample of veterans referred for care due to substance misuse or other behavioural problems. The studies considered the insomnia symptoms of difficulty falling asleep (sleep latency), difficulty staying asleep (waking after sleep onset) and an unsatisfactory quality of sleep (sleep quality). In the first retrospective chart review study (n=84), the insomnia symptoms reported by the veterans were not found to be predicted by suicidal ideation<sup>110</sup>. Rather, factors such as not having a partner, having a comorbid psychiatric disorder, being a current smoker, and younger age were all associated. In the second retrospective chart review study (n=161), up to one third of the veterans reported suicidal ideation over the past year<sup>111</sup>. These veterans reported more financial problems, more insomnia symptoms, shorter sleep duration and a higher prevalence of psychiatric disorders, drug use and pain symptoms. Multivariate analysis found that of the insomnia symptoms only poor sleep quality was associated with suicidal ideation. Other factors also found to be positively associated with suicidal ideation included: older age, inadequate finances, and the presence of psychiatric disorder. In another study examining 1,640 contemporary veterans post-deployment, 72% reported poor sleep quality<sup>106</sup>. Logistic regression found sleep quality was highly correlated with suicidal ideation (almost 6 times the rate), as well as PTSD (5 times the rate), and major depressive disorder (9 times the rate). The study found very short sleep duration and long sleep duration were associated with increased odds of PTSD, major depressive disorder, and smoking.



Overall, these studies suggest that psychiatric disorders such as PTSD, depression, substance abuse, and social factors such as significant relationships<sup>110</sup> and financial pressure<sup>110</sup> are instrumental to a veteran's experience of insomnia and suicidal ideation. There does not appear to be strong support in the 2013 literature for a simple causal relationship between insomnia and suicidal ideation. Rather, it seems that the relationship is tempered by these psychiatric and social factors. As noted earlier, insomnia presents with less stigma among serving personnel and veteran populations, and interventions targeting insomnia may prove beneficial in reducing psychiatric symptoms as well as suicidal ideation. For example, an exercise intervention for veterans found exercise was associated with fewer depressive symptoms and better sleep patterns, each of which was, in turn, related to lower suicide risk<sup>58</sup>.

### Veterans with sleep disturbance and older age

Sleep disorders or changes to normal patterns of sleep assumed to be related to ageing may in fact be caused by a combination of ageing and the burdens of former military service. It is important to identify the cause of the sleep problem as an accurate diagnosis and appropriate treatment with older adults may alleviate symptoms and reverse deficits in cognitive function brought about by the sleep problems<sup>112</sup>.

The prevalence of nightmares among ageing veterans was considered in a large-scale longitudinal, epidemiological study involving a Finnish war generation (including those who were veterans of WWII and 18 at the end of the war) and a general adult population (those who were children after the end of WWII)<sup>113</sup>. Participants included a total of 69,813 people (33,811 men and 36,002 women) aged 25-74 years who had taken part in eight independent cross-sectional population surveys from 1972 to 2007. The study found nightmare prevalence to increase with age, particularly for men. The prevalence of nightmares was elevated for war veterans and the war generation who also reported more symptoms of insomnia, depression and anxiety than those in the general adult population. The authors concluded that exposure to war elevates nightmare prevalence as well as insomnia, depression and anxiety symptoms, even decades after the war. Unfortunately, this study did not measure PTSD symptoms and it is not possible to establish prevalence of idiopathic as opposed to posttraumatic nightmares. The authors noted that posttraumatic dreams can persist for decades after the trauma, and that it is reasonable to suggest that the difference between the war veterans and the general population stems from a difference in posttraumatic nightmares. Limitations included the retrospective recall of dreams and nightmares, rather than the use of a dream log book, and the term nightmare was not defined and may have varied subjectively among the sample.



## PTSD and cardiovascular disease

There is significant interest in whether PTSD is a cause of cardiovascular disease. Three mechanisms have been proposed through which PTSD may be linked to the development of cardiovascular disease: biological, behavioural and psychosocial<sup>114</sup>. With respect to biological mechanisms, the experience of trauma and subsequent development of PTSD can result in the dysregulation or dysfunction of the relevant biological systems involved, such as the immune, autonomic nervous, neuroendocrine, vascular endothelium and metabolic systems. This dysregulation produces physiological changes that can result in atherosclerosis<sup>‡</sup> which in turn increases the risk of cardiovascular disease<sup>114,115</sup>. Certain behavioural and psychosocial risk factors are also associated with increased risk of cardiovascular disease. When these factors are combined with the biological risk factors, the level of risk for cardiovascular disease is compounded. Behavioural risk factors associated with PTSD include substance use, obesity, decreased physical activity, medication non-adherence, and sleep disturbances, which in turn may increase cardiovascular disease risk<sup>114</sup>. Psychosocial risk factors comorbid with PTSD include depression, anger and hostility, social isolation, and socioeconomic status, which are all risk factors for cardiovascular disease.

Several reviews were conducted in 2013 that identified PTSD as an independent risk factor for cardiovascular disease, coronary heart disease<sup>§</sup> and/or cardiac-specific mortality<sup>114-117</sup>. One meta-analysis of six studies published between 2007 and 2013 involving data from over 400,000 participants found a significant association between PTSD and incidence of coronary heart disease and/or mortality, even after adjustment for demographic, clinical and psychosocial factors<sup>117</sup>. Specifically, PTSD was associated with a 55% increase in risk for incidence of coronary heart disease or cardiac-specific mortality, which was attenuated to a statistically significant 27% increased risk when adjusted for depression. Of note, four of the six studies in the meta-analysis used US veteran samples. The remaining two studies used US samples with participants exposed to the 2001 World Trade Centre attacks and a sample of women exposed to various traumas.

One of the studies included in the meta-analysis was published in 2013 and reported on prevalence rates of coronary heart disease in veterans. The study retrospectively investigated 281 sets of twins over a 13 year time period. In each set, both twins were US Vietnam veterans, with one twin having PTSD while the other did not. A twin with PTSD was twice as likely to be diagnosed with coronary heart disease (22%) as their

<sup>‡</sup> Atherosclerosis is when plaque accumulates in arteries.

<sup>§</sup> Coronary heart disease occurs when plaque has accumulated in the arteries of the heart and is the most common type of cardiovascular disease.



twin without PTSD (9%)<sup>118</sup>. The increased risk remained even after controlling for lifestyle behaviours known to impact cardiovascular disease. The PTSD twins also had poorer cardiovascular health, as indicated by objective, cardiac-related measures. The greatest strength of this study is that unmeasured genetic and familiar factors that could impact PTSD or cardiovascular disease were controlled for, through the use of a twin sample.

While PTSD is linked to cardiovascular disease risk, one 2013 study indicates that it might be trauma, not PTSD, which is associated with cardiovascular disease<sup>119</sup>. In a cohort study of 1,021 participants followed on average for 7.5 years, greater lifetime traumatic event exposure was associated with higher risk of cardiovascular disease-related events. This relationship was not explained by various known risk factors, including the presence of PTSD. The study provides insight into the potential role of cumulative trauma exposure as a risk factor for cardiovascular disease and that the risk can occur without a psychiatric disorder.

## Risk factors for PTSD and cardiovascular disease

Several studies in 2013 investigated various risk factors associated with PTSD and cardiovascular disease, some of which used veteran populations. In a retrospective longitudinal study of nearly 500,000 US OEF/OIF veterans in the VA healthcare system, 75% recorded body-mass indexes (BMI) that were overweight or obese<sup>120</sup>. Veterans who were overweight or obese were also classified into whether they were stable overweight or obese weight, overweight or obese and gaining weight, or obese and losing weight over a three-year period. Those with mental health conditions, including PTSD, were more likely to be classed as having stable obesity or overweight or obese and continuing to gain. Depression was associated with the highest risk of being stable obese among women. PTSD was associated with the highest risk of being stable obese among men, which is of particular importance, given that being overweight or obese is a known risk factor for cardiovascular disease.

In a study of 663 US veterans, heart blood flow during exercise, which is considered an objective indicator of cardiovascular disease<sup>121</sup>, was investigated. After accounting for several risk factors including health behaviours, socio-demographics, and prior cardiovascular disease, veterans with PTSD had a significantly greater likelihood of having decreased blood flow to the heart compared to those veterans without PTSD. The strength of this study is that objective cardiovascular indicators such as heart blood flow are often present before cardiovascular disease events occur, whereas studies that rely on subjective reports of cardiovascular disease may under-represent true incidence



of cardiovascular disease. These findings add to those indicating PTSD is a risk factor for cardiovascular disease.

One 2013 study investigated whether individuals with PTSD at different stages of the disorder had differences in cardiac-related physiology<sup>122</sup>. Inflammation, indicative of immune dysfunction, is a risk factor for cardiovascular disease<sup>117</sup>, and levels of inflammatory biomarkers were investigated in three groups of women (n=77). The three groups included: women with PTSD; women with prior PTSD who were no longer symptomatic; and women without PTSD. How the women with prior PTSD became asymptomatic was not reported. Results showed that women who had recovered from PTSD had significantly lower levels of inflammatory biomarkers than women who had not recovered from PTSD and had comparable levels to controls. Due to the cross-sectional nature of the study however, it is unclear if women with lower levels of inflammation are more likely to recover from PTSD or if recovery from PTSD reduces inflammation<sup>122</sup>. It is also important to note that those women in the recovery PTSD group had experienced their trauma significantly longer ago than the active PTSD group, which may influence inflammation levels. In addition, it is unclear how these findings apply to men with PTSD, therefore it would be beneficial for this study to be replicated with a male sample. Regardless, the findings indicate that rates of inflammation, which is a risk factor for cardiovascular disease, are variable at different stages of PTSD.

## The relationship between cardiac activity and PTSD

Several studies in 2013 investigated physiological differences in cardiac activity in those with PTSD compared to controls. Physiological differences in cardiac activity or reactivity to situations has been linked to cardiovascular disease risk<sup>123,124</sup>. In cardiac reactivity studies, various indices of cardiac activity such as heart rate and blood pressure are measured prior to, during, and after exposure to a stimulus to track changes in cardiac activity. For example, in a study of 19 males and females with PTSD and 16 male and female trauma-exposed controls without PTSD, heart rate was assessed at several stages, including when participants listened to a narrated version of their own traumatic event after they had scripted it<sup>124</sup>. The groups differed significantly in cardiac reactivity. Specifically, resting\*\* heart rate levels were higher in the PTSD group than the controls. While listening to their traumatic event, both of the groups experienced significant increases in heart rate however, those with PTSD remained at significantly higher levels of cardiac reactivity post-exposure, whereas the controls experienced significant reductions in cardiac reactivity that returned to pre-exposure levels once the audio had finished. Higher rates of cardiac activity for PTSD participants may be indicative of a

\*\* Resting heart rate is typically collected during a 10 minute period during which the participant is awake but relaxed, also known as basal heart rate



dysfunction in the relevant physiological system, or symptomatic of significant psychological stress associated with an experiment<sup>125</sup>. The authors speculate that this cardiac reactivity in the PTSD group, both during trauma-related and non-trauma related activities, could be related to increased likelihood of risk for cardiovascular disease that is observed in those with PTSD.

A second study retrospectively investigated rates of blood pressure and heart rate in those with PTSD compared to those without<sup>126</sup>. In 186 US OEF/OIF veterans, of whom 88 had PTSD, diastolic blood pressure, systolic blood pressure and heart rate were found to be significantly higher in the PTSD group. Additionally, when veterans were split into three groups: those with PTSD, those who were trauma-exposed but did not have PTSD, and those who were not trauma-exposed, results showed that those who were trauma-exposed but without PTSD had significantly higher blood pressure than the non-trauma exposed, but lower blood pressure than the veterans with PTSD. These findings add to the evidence that trauma without PTSD may be an independent risk factor for cardiovascular disease.

A third study also investigated cardiac activity in 15 US OEF/OIF veterans with moderate to high levels of combat exposure<sup>123</sup>. Heart rate was recorded over a 24-hour period in which the veteran remained bed-ridden for the entire duration. Specifically, veterans with PTSD had higher heart rates and diminished heart rate variability compared to those veterans without PTSD, and this difference was more pronounced between group heart rates in the evening. In addition, the PTSD group showed a lack of significant differences between day and evening rates of cardiac activity which the authors propose may be linked to night-time PTSD symptom expression. This lack of variation in cardiac activity between day and evening is indicative of a biological system dysfunction which the authors linked to an increased risk for cardiovascular disease.

A fourth study found conflicting results on cardiac reactivity, in comparison to the previous three studies. Researchers investigated heart rate in female refugees with PTSD who had experienced multiple traumatic events to females of similar ethnic backgrounds without PTSD<sup>125</sup>. Resting heart rate was measured, after which the participants were exposed to a loud, sudden noise designed to elicit cardiac response at three different time points. There were no differences in heart rate between groups at resting or during noise exposure. However, within the PTSD group there were positive correlations between symptom severity and heart rates at resting and during noise exposure. These findings indicate that the more severe the PTSD is, the more severe the cardiac reactivity, which means higher risk for cardiovascular disease, although the causation is unclear.



Other studies in 2013 found a dose-response relationship between PTSD symptom severity and cardiovascular disease risk<sup>117,121</sup>, but how more severe PTSD is related to greater cardiovascular disease risk is unknown<sup>121</sup>. While multiple studies have now established PTSD as an independent risk factor for cardiovascular disease, much remains unknown about the nature of the relationship, including the role of gender, which has a unique relationship with both incidence of PTSD and cardiovascular disease<sup>117</sup>. Longitudinal studies are needed to untangle the relationship between the experience of trauma, the development and severity of PTSD, and subsequent cardiovascular disease risk. This remains an important area for further research, with cardiovascular disease a leading cause of death in Australia, affecting one in six Australians and killing one Australian every 12 minutes<sup>127</sup>.



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